DM/84/54   INTERNATIONAL MONETARY FUND

Exchange and Trade Relations Department

Effects of Increased Market Access on Selected Developing
Countries' Export Earnings: An Illustrative Exercise

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August 24, 1984

I. Introduction

An important aspect of the recent concern about the rising trend
of protectionism relates to developing countries' access to foreign
markets. Many developing countries facing balance of payments and debt
difficulties are undertaking adjustment programs supported by financial
assistance from the Fund. These programs often include, inter alia, the
pursuit of more outward-oriented development strategies and the promotion
of exports with a view to establishing a viable balance of payments and
external debt position, and sustainable growth in the medium term. The
external environment facing developing countries will importantly influ-
ence the success of their own adjustment efforts. Although the external
environment is determined by a host of factors (including the extent of
economic recovery in industrial countries, developments in world commo-
dity prices, and the evolution of exchange and interest rates abroad),
the stance of trade policies in partner countries can be a critical
constraint on possible export expansion in the short to medium term.

This paper represents an initial attempt to pull together the most
recent available evidence on trade barriers in the main industrial coun-
tries and investigate the potential impact of their liberalization on
the exports of selected developing countries. As with any illustrative
exercise based on simplifying assumptions, its results must be qualified.
In any case, we believe there is considerable scope for fruitful experi-
mentation with alternative methodologies, with a view to developing more
refined measurements of the effects of trade liberalization, particularly
on the adjustment efforts of developing countries. While this paper
focuses rather narrowly on the effects of liberalization on exports, it
is important to bear in mind that the longer term positive effects of an
open trading environment on structural adjustment and efficient resource
allocation are also important for economic growth.

Several studies have brought out the negative effects for growth and trade of protectionist practices affecting developing countries. Using internationally linked econometric country models (Project LINK), Klein and Su 1/ studied the worldwide effects of a (5, 10, 20 percent) tariff increase for manufactured imports of 13 OECD countries. They concluded that such an increase in protectionism reduces trade and growth in both industrial and developing countries. Brown and Whalley 2/ evaluated the effects of alternative tariff-cutting formulae proposed by major participants in the Tokyo Round, and of more substantial trade liberalization, by means of a computable general equilibrium model of the world economy. From their analysis, one can conclude that tariff reductions alone would increase world welfare slightly, but redistribute income through changes in terms of trade from developing to developed countries; however, abolition of all tariff and nontariff barriers would increase welfare for both groups. These results are broadly confirmed by studies by Deardorff and Stern, 3/ who used the same type of analysis to study the effects of the Tokyo Round. Baldwin and Murray, 4/ Cline et al., 5/ and Sapir and Baldwin 6/ chose partial analysis to evaluate the effects of tariff reductions on developing countries in light of their existing tariff advantages under the Generalized System of Preferences. These studies lead one to conclude that gains for developing countries from MFN tariff reductions would far outweigh potential losses due to an erosion of their tariff preferences. Valdes and Zietz 7/ estimated the effects of trade liberalization in 17 OECD countries on selected agricultural exports from 56 developing countries, and found that a 50 percent reduction in trade barriers would result in an annual increment of 11 percent in developing country exports of agricultural products in 1975-77. Altogether, the studies attribute positive overall welfare

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1/ L.R. Klein and V. Su, "Protectionism: An Analysis from Project LINK." Journal of Policy Modeling, Vol. 1 (1979) No. 1, pp. 5-35.

2/ F. Brown and J. Whalley, "General Equilibrium Evaluations of Tariff-Cutting Proposals in the Tokyo Round and Comparison with More Extensive Liberalization of World Trade," Economic Journal, Vol. 90 (December 1980), pp. 838-866.

3/ A.V. Deardorff and R.M. Stern, "A Disaggregated Model of World Production and Trade: An Estimate of the Impact of the Tokyo Round," Journal of Policy Modeling Vol. 3 (1981) No. 2, pp. 127-152. Deardorff, A.V. and R.M. Stern, "Economic Effects of the Tokyo Round, Southern Economic Journal, Vol. 49 (January 1983), pp. 605-624.

4/ R.E. Baldwin and T. Murray, "MFN Tariff Reductions and Developing Country Trade Benefits under the GSP," Economic Journal, Vol. 87 (March 1977), pp. 30-46.

5/ W.R. Cline, N. Kawanabe, T.O.M. Kronsoe, and T. Williams, Trade Negotiations in the Tokyo Round: A Quantitative Assessment, Washington, D.C., 1978.

6/ A. Sapir and R.E. Baldwin, "India and the Tokyo Round," World Development, Vol. 11 (1983) No. 7, pp. 565-574.

7/ A. Valdes and J. Zietz, Agricultural Protection in OECD Countries: Its Cost to Less-Developed Countries, International Food Policy Research Institute, Research Report 21 (Washington, D.C.), December 1980.

and trade effects to trade liberalization. Further, they emphasize the importance of a lowering of nontariff barriers to trade for developing countries' growth and trade performance. 1/

The present exercise estimates the impact of a hypothetical elimination of tariff and nontariff barriers in four selected OECD markets for seven selected sectors on the exports of ten developing countries. 2/ The developing countries represent a geographically distributed sample of Fund members which are currently undertaking adjustment programs with Fund financial assistance or have done so in the recent past. In terms of World Economic Outlook classifications, the sample consists of non-oil developing countries; four are among the major exporters of manufactures within the group of net oil importing developing countries, and three are classified as low-income countries. 3/ Except for Kenya, the other countries in the sample belong to the group of "major borrowers," defined as the 25 developing countries with the largest outstanding external debt in 1982. Together, the 10 sample countries accounted for just under one third of exports of non-oil developing countries in 1979-81. The selected sectors include both agricultural and manufactured products of interest to developing countries. In these sectors, trade barriers (particularly nontariff restrictions) are relatively high or have tended to grow since the mid-1970s in many industrial countries, and the threat of future protectionism persists. 4/ The selected sectors accounted for 26 percent of the total exports of the sample countries, and 25 percent of their exports to the four markets on average in 1979-81. 5/

1/ The studies use static frameworks for their analyses. However, Easton and Grubel ("The Costs and Benefits of Protection in a Growing World," Kyklos, Vol. 36 (1983) No. 2, pp. 213-230) point out that, in a dynamic framework, the costs of protection are likely to grow at the rate at which international trade expands. This is because protection impedes exploitation of the opportunity for gains from trade, such as economies of scale and intra-industry trade, which grow at that rate. Hence, the costs of protection, as measured in the economic literature, so far tend to be substantially underestimated.

2/ The seven sectors considered are meat, cereals, sugar, textiles, clothing, footwear, and iron and steel. The importing countries are the United States, the EC, Japan, and Canada. The sample developing countries considered are Argentina, Brazil, India, Kenya, Korea, Mexico, Pakistan, the Philippines, Turkey, and Yugoslavia.

3/ World Economic Outlook, IMF Occasional Paper No. 27, April 1984, Statistical Appendix, pp. 167-168.

4/ For a survey of recent trade policies in the seven sectors, see S.J. Anjaria, et al., Developments in International Trade Policy, IMF, Washington, D.C. 1982.

5/ These ratios have important implications for the overall results, as discussed in a later section, but it is useful to emphasize that the main criterion for selection of the developing countries was representation of the various geographical regions (three are in the Western Hemisphere, three in Asia, two in Europe, one in the Middle East, and one in Africa), rather than the structure of their exports.

The analytical framework of the exercise is presented in section II and the data base is described in section III. Section IV presents the results, and a sensitivity analysis is carried out in section V. The final section provides comments on the interpretation of the results.

II. Analytical Framework

The exercise's aims are modest and limited: it tries to provide indicative estimates of the effect of lowering trade barriers on exports under certain simplifying assumptions. It is by no means an in-depth investigation of the trade liberalization process and all its economic consequences; in particular, welfare effects are not taken into account.

The exercise is based on partial analysis. It utilizes a simple framework describing demand and supply for the seven sectors by standard two-country market models. 1/ In these, percentage changes in import demand, export prices, and export earnings may be written as functions of the price elasticities of import demand and export supply, as well as of the percentage change in the one-plus-ad valorem tariff equivalent of trade (tariff plus nontariff) barriers.

Export supply and import demand for item i in a two-country model with exporting country k and importing country j can be described by the following equations:

(1) $\quad M_{ij} = M_{ij}(P^D_{ij})$

(2) $\quad P^D_{ij} = t_{ij} \, P^W_i$

(3) $\quad X_{ik} = X_{ik}(P^W_i)$

(4) $\quad M_{ij} = X_{ik}$

(5) $\quad R_{ik} = P^W_i \cdot X_{ik}$

where M = import demand (in volume terms); X = export supply (in volume terms); P^D = importing country's domestic price; P^W = export (pre-duty) price; t = one-plus-ad valorem tariff 2/ rate; R = exporter's revenue

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1/ Ideally, we would have liked to construct world demand and supply models for the selected sectors, taking account of all the producing and consuming countries, as well as interlinkages between the sectors. However, there were many conceptual and empirical problems associated with the multi-country, multi-sectoral approach. Hence, for the purposes of this illustrative exercise, a simpler framework was adopted in which we could work with the available parameters.

2/ Tariff equivalent of tariff and nontariff barriers.

(importer's expenditure at pre-duty prices); and the subscripts i, j, and k denote the i-th item, the j-th (importing), and the k-th (exporting) country.

Differentiating (1) to (5) totally and solving for the percentage changes of imports, export (pre-duty) prices, and exporter's revenue yields the following equations:

$$(6) \quad \frac{dM_{ij}}{M_{ij}} = \frac{n_{ij}}{1 - n_{ij}/e_{ij}} \frac{dt_{ij}}{t_{ij}}$$

$$(7) \quad \frac{dP_i^W}{P_i^W} = - \frac{n_{ij}}{n_{ij} - e_{ik}} \frac{dt_{ij}}{t_{ij}}$$

$$(8) \quad \frac{dR_{ik}}{R_{ik}} = n_{ij} \cdot \frac{(1 + e_{ik})}{(e_{ik} - n_{ij})} \cdot \frac{dt_{ij}}{t_{ij}}$$

where n = price elasticity of import demand and e = price elasticity of export supply.

In this model, trade flows and exporter's revenues (or importer's expenditures in pre-duty prices) are a function of the percentage change of the one-plus-ad valorem tariff rate and of the elasticities of supply and demand. For exporter's revenues, this can be illustrated by tabulating the change in this revenue (dR_{ik}/R_{ik}) for a given cut in the tariff level (or the tariff equivalent of trade barriers) and a range of values for e_{ik} and n_{ij}:

Change in Exporter's Revenue (dR_{ik} / R_{ik})

Price Elasticity of Import Demand (n_{ij})	Price Elasticity of Export Supply (e_{ik})				
	0	1/2	1	2	Infinity
- 1/2	$-\frac{dt}{t}$	$-\frac{3}{4}\frac{dt}{t}$	$-\frac{2}{3}\frac{dt}{t}$	$-\frac{3}{5}\frac{dt}{t}$	$-\frac{1}{2}\frac{dt}{t}$
- 1	$-\frac{dt}{t}$	$-\frac{dt}{t}$	$-\frac{dt}{t}$	$-\frac{dt}{t}$	$-\frac{dt}{t}$
- 2	$-\frac{dt}{t}$	$-\frac{6}{5}\frac{dt}{t}$	$-\frac{4}{3}\frac{dt}{t}$	$-\frac{3}{2}\frac{dt}{t}$	$-2\frac{dt}{t}$

where t = 1 + T, with T = ad valorem tariff (tariff equivalent of trade barriers); hence dt/t = dT/(1 + T).

With unit elastic demand, exporter's revenues are not affected by the export supply response. Hence, the second line of the above matrix shows the same percentage change of exporter's revenues for all export supply elasticities considered. If import demand is elastic, however, price reductions are overcompensated by increases in sales, so that exporter's revenues grow more than proportionately. Hence, if import demand is price elastic, the higher the supply elasticity the larger is the change in exporter's revenues. On the other hand, with inelastic import demand, price reductions due to tariff cuts are not compensated by respective quantity increases. Consequently, the higher the export supply elasticity, the smaller the increase in exporter's revenues. If import demand elasticities lie in the range between -1/2 and -2, one can expect exporter's revenues to grow between 1/2 and 2 times the percentage cut in one-plus-ad valorem tariff rates, regardless of the values of the export supply elasticities.

Chart 1 illustrates the partial analysis cases in a two-country model according to different assumptions about the price elasticities of supply of the imported commodity. The figures represent the importing country, or market: the demand schedule for imports of the given commodity is DD. p^W is the pre-duty (import) price, and p^D is the post-duty (domestic) price.

In figure A, with an infinitely elastic supply of the imported commodity, the importing economy faces a supply curve S, which is the horizontal (price) line at the P^W level. Before liberalization, domestic equilibrium is indicated by E. Total domestic expenditure is $OQd \times OP^D$; exporters, however, only receive $OQd \times OP^W$, the difference accruing to the government of the importing country as tariff revenue (or split between government and private importers in the importing country if nontariff barriers are present). After liberalization, domestic equilibrium is at E', and domestic expenditure on the imported item is $OQ_d' \times OP^W$, all of which now goes to the exporter. 1/ The extent of the gain to the exporter depends on the elasticity of demand for imports.

The case of a zero elasticity of supply of the imported commodity is illustrated in figure B: the importing country faces a supply curve S, which is now the vertical line at the Qd level, as supply is fixed. The point of equilibrium before liberalization is at E, and does not change after liberalization. The exporter now is able to extract from the importing market the full domestic price P^D. The elasticity of import demand plays no role in determining the gain to the exporter from liberalization.

1/ In the case of nontariff barriers, however, it is possible that part of the difference between $OQ_d \times OP^D$ and $OQ_d \times OP^W$ accrued before liberalization to the exporter in the form of a rent. If this is so, gains to the exporter as a result of trade liberalization are somewhat less than assumed in the above model.

In Figure C, the case of a finite positive supply elasticity is illustrated. The importing country faces an upward sloping supply curve. In this case, liberalization will determine a gain to the exporter which will be a function of both import demand and export supply elasticities.

The exercise does not explicitly take account of the different degrees of substitution or differentiation between the imported products and similar domestically produced commodities. However, in applying the two-market model to rather broad product groups in a multi-country framework, it implicitly assumes that domestic and imported products, and imported products from different sources, are imperfect substitutes. 1/

III. Assumptions and Data Base

Import and export data for countries and products were based on OECD and UN statistics, and averages for the period 1979-81 were used. For estimates of the three parameters (price elasticities of import demand and export supply and height of trade barriers), the general approach was to rely on existing studies to the extent feasible and to utilize judgmental estimates and simplifying assumptions in other cases.

For price elasticities of import demand, estimates from Cline, et al. (op. cit.) were used (Table 1). These represented the middle values of a range of low and high estimates based on an extensive literature survey, and corresponded closely to those published by other researchers. 2/ Since information on the value of export supply elasticities for the countries and commodities under investigation is incomplete or unreliable, it was assumed that these elasticities were uniform among the countries under investigation, and between them and the rest of the world. This implies that, following trade liberalization, exporting countries would hold their original market share in international trade. The two limiting values (zero and infinite) of the elasticities were employed, in order to establish lower and upper bounds for exporters' revenue gains from trade liberalization; intermediate values for the elasticities were used in performing a sensitivity analysis.

Estimation of tariff equivalents of nontariff barriers (NTBs) presents many difficulties, particularly when NTBs are applied discriminatorily, as, for example, in the textiles and clothing sectors.

1/ The higher the degree of substitutability, ceteris paribus, the greater would be the shift in demand from the domestically produced to the imported commodity and the reallocation among imported commodities from different sources induced by trade liberalization. However, this may depend on the time frame considered. In the short run, less competitive industries may respond by reducing profit margins and expanding production in an attempt to maintain market shares; over the medium term, however, resources will tend to shift out of these industries, or producers will introduce more product differentiation.

2/ R.M. Stern, et al., Price Elasticities in International Trade: A Compilation and Annotated Bibliography of Recent Research, London, 1976.

Available quantitative estimates of the height of trade barriers for the seven sectors show a wide variation (see Appendix Table 1). Reasons for the large differences include, inter alia, differences in concepts of "world market" reference prices, product definitions, and time periods for estimation. In the framework of the current exercise, selection of representative estimates from the available information was based on judgment and in the light of qualitative information on trade measures and policies. For agricultural products, the general approach was to rely on published coefficients of nominal protection. 1/ The starting point for estimates for manufactures was the comprehensive work done by Yeats on trade barriers existing in 1973. 2/ Since Yeats' estimates, however, may not always reflect more recent developments, nor always match the level of commodity disaggregation chosen in this exercise, they were adjusted to provide as uniform and current a basis for this exercise as possible.

In the case of meat, estimates of trade barriers in 1977-79 in the four OECD markets for beef were employed. 3/ More recently, the restrictiveness of trade measures appears to have increased in this sector, but no allowance was made for this factor. For cereals, for the EC, the average coefficient of nominal protection (percentage difference between EC threshold and c.i.f. Rotterdam prices) for wheat, barley, and maize in 1979-80 as estimated by Koester 4/ was used. For Japan, the average of coefficients of nominal protection for rice, wheat, barley, and soybeans in 1979 was taken. 5/ For the United States, Yeats' 1973 estimate was retained; indications are that protection declined in the late 1970s, but, according to some studies, rose again in the early 1980s. 6/ In the absence of sufficiently specific information for Canada, and against the background of similar agricultural trade policies followed in the past, protection in Canada in the cereal and sugar sectors was assumed to be the same as in the United States, though admittedly this could be an overestimation.

In the sugar sector, for the United States, the average 1979-80 ratio of New York after-duty prices and Caribbean world market prices, adjusted for a transport cost component of 6 percent, was employed. 7/

1/ For a discussion of the limitations of this approach, see S.J. Anjaria, et al. (1982), p. 36.

2/ A.J. Yeats, Trade Barriers Facing Developing Countries, New York, 1979.

3/ FAO, Protectionism in the Livestock Sector, Rome, 1980.

4/ U. Koester, Policy Options for the Grain Economy of the European Community: Implications for Developing Countries, IFPRI Research Report No. 35. Washington, D.C., 1982.

5/ S.J. Anjaria, et al., (op. cit.). The domestic price was the price paid to producers and the world price the unit c.i.f. value of Japanese imports.

6/ Chemical Bank, Current U.S. Agricultural Policies: Assessment and Impact, 1983.

7/ U.S. Department of Agriculture, Sugar and Sweetener: Outlook and Situation, Washington, D.C., 1981.

(It may be noted that, in 1982, the United States imposed import quotas and raised tariffs in this sector.) For the EC and Japan, coefficients of nominal protection for 1979-80 (percentage differences between domestic and c.i.f. prices) were taken from studies by the Commonwealth Secretariat 1/ and the Fund staff, 2/ respectively.

For the commodities belonging to the manufacturing sector, the post-Kennedy Round levels were employed for tariffs, and estimation of the tariff equivalent of NTBs was based on various studies. For textiles and clothing, for the EC and the United States, Yeats' 1973 estimates of NTBs for apparel were adjusted upward on the basis of a study by Morici and Megna, 3/ who report a tariff equivalent of measures under the MFA for the United States between 1973 and 1981 of 8.8 percent. This figure was used to update 1973 NTBs for textiles and clothing for both the EC and the United States. 4/ For Japan, only post-Kennedy Round tariffs were used for both textiles and clothing, in the absence of evidence of significant NTBs. 5/ Estimates for the Canadian textiles and clothing industries were obtained from Wolf. 6/

Since no estimates of NTBs were available specifically for steel, these were approximated, in the first instance, by Yeats' estimates of average NTBs for manufacturing in 1973 in the EC and the United States.

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1/ Commonwealth Secretariat, Protectionism: Threat to International Order, London, 1982.

2/ S.J. Anjaria, et al. (op. cit.).

3/ P. Morici and L.L. Megna, U.S. Economic Policies Affecting Industrial Trade, Washington, D.C., 1983. This recent study gives an assessment of U.S. trade policies implemented in the last 10 years, and provides estimates of the protection afforded by nontariff restrictions in a number of industries. For textiles and apparel, the authors calculated the reduction of imports induced by the 1974 Multifiber Agreement, and estimated the tariff equivalent of the MFA at 8.8 percent (p. 23). From this, they concluded that protection provided by nontariff barriers to the U.S. clothing industry was around 8.8 percent in 1976 (p. 100). Yeats, however, estimated the tariff equivalent of nontariff barriers for the U.S. clothing industry at 40 percent in 1973. The estimate by Morici and Megna seems to reflect (and is used here as) additional protection by the MFA for the U.S. clothing industry, rather than the actual height of nontariff trade barriers in 1976. We have used their estimate for steel in the same way.

4/ Following Yeats, estimates for France were used as indicators for the EC in the textile and clothing and steel industries.

5/ According to the GATT, Japan maintains no bilaterally negotiated import restrictions on textiles and clothing. See Report to the Textiles Committee by the Textiles Surveillance Body, GATT document COM.TEX/SB/811 Add.1 of December 13, 1982.

6/ M. Wolf, "Managed Trade in Practice: Implications of the Textile Arrangements," in W.R. Cline (ed.), Trade Policies in the 1980s, Washington, D.C. 1983. The simple average of total protective rates for 16 products in 1979 was employed.

These figures were then updated, using estimates made by Morici and Megna that refer to the effect of NTBs in the U.S. steel industry in the period 1976-77 (it may be noted that nontariff restrictions in the steel sector have increased significantly in the United States and the EC since 1980.) For Japan and Canada, the steel industry is fairly competitive internationally, and only tariffs were included in estimating the height of trade barriers.

Finally, in the footwear sector, for the United States and Japan, in the absence of evidence of significant NTBs, only tariffs were used. On the basis of available qualitative information, NTBs in the EC foot- wear industry were assumed one third of those for clothing and textiles. For Canada, global quotas on footwear are applicable, but, in the absence of available quantitative estimates, NTBs for the footwear industry were assumed to be about three fourths of those for textiles and clothing.

The estimates of tariff equivalents of trade barriers are contained in Table 2. They should be taken only as a rough indication of the order of magnitude and relative size of protection around 1980.

IV. Results of the Liberalization Exercise

1. Importing countries

Table 3 gives the results for the percentage change of imports induced by a complete, nondiscriminatory removal of trade barriers in the selected sectors in the selected OECD countries under the assumption of infinite export supply elasticity. 1/ The figures reflect increases in physical trade since export prices are expected to remain unchanged under the infinite export supply elasticity assumption. Altogether, the results indicate that a complete removal of barriers to trade in the selected OECD markets would increase imports of agricultural products in the liberalized sectors by about 20-50 percent and imports of liberalized manufacturing products by about 30-90 percent. As expected, given the generally higher import demand elasticities for manufactured products than for agricultural products, trade liberalization for manufactured products would induce more imports than liberalization for agricultural products. For Japan, however, some differences are noteworthy. The extraordinarily high import elasticity for meat, together with the rela- tively high protection of the domestic meat industry, give significantly larger estimates of import increases for Japan than for other importing countries. On the other hand, owing to the assumed relatively low import elasticity for clothing, together with the rather moderate estimate of protection of the Japanese clothing industry, Japan's imports of clothing increase less than in the other countries.

1/ The increases in imports derive from all sources and not only from the sample exporting countries. Of course, under the assumption of zero export supply elasticity, import volumes would not increase.

Although this exercise was not formulated to assess the impact of trade liberalization on import penetration ratios, some broadly indicative computations were made. The results (Appendix Table 2) show that a complete removal of trade barriers would raise the overall import penetration ratio in the importing countries by 2 percentage points at most. There would, however, be large changes in the EC, U.S., and Canadian textile and clothing industries, ranging from 9-14 percentage points. Given the assumptions of no change in consumption and crowding out of domestic producers by importers, these figures rather represent indicative upper limits to increases in import penetration ratios.

2. Exporting countries

Table 4 gives the effects of hypothetical trade liberalization in major OECD markets on the exports of the sample developing countries. With infinite export supply, the most striking increases occur in the clothing sector, while export growth in the meat, textile, steel, and footwear sectors also seems substantial. Sugar and cereal export growth rates are smaller. On a combined basis, increased exports of the seven sectors would raise total exports of the ten developing countries by about 9 percent ($8.0 billion in average 1979-81 prices). 1/ Table 5 gives the results separately for agricultural and manufactured exports. Thus, the increases in exports of the three agricultural sectors would raise total agricultural exports by some 4 percent; similarly, total manufactured exports would rise by about 16 percent.

With zero elastic export supply, the overall export increase for the sample developing countries amounts to over 4 percent. Since volumes traded now remain constant, the increase in export earnings is attributable to the rise of export prices to the level of domestic prices in the OECD markets. In the case of agricultural sectors, where the import elasticities in most OECD countries are below one, the increase in export earnings tends to be larger than would be the case if export supply were infinitely price elastic, whereas the opposite holds for nonagricultural products.

The export increases resulting from the hypothetical trade liberalization are unequally distributed among the sample countries, reflecting the varying composition and geographical distribution of their exports. They range from 0.6 percent for Kenya to nearly 18 percent for Korea. Several factors influence this distribution: (1) the countries face different average rates of protection in the seven sectors according to the product and geographic composition of their exports; (2) the countries face different average elasticities of export demand according to their trade pattern; (3) most importantly, the seven sectors' shares in total exports to the world and to the four markets differ widely across the ten sample developing countries. Table 6 shows these features for the sample countries.

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1/ It is to be noted that, when calculating the increase in _total_ exports, both the exports of the nonliberalized sectors and exports of the liberalized sectors to the nonliberalizing markets are held constant.

V. Sensitivity Analysis

As noted in section II, three important parameters determine
the results of this exercise: the export supply and import demand
elasticities, and the tariff equivalents of tariff and nontariff
barriers in the seven sectors of the four OECD markets. To test the
sensitivity of the results of the illustrative exercise to variations
in these parameters, and taking into account that previous studies,
taken together, do not always provide sufficient assurance of the
accuracy of the estimates employed, several sensitivity tests were
performed.

First, export supply elasticities were varied over a broad
range. In addition to the two limiting cases of zero and infinity,
intermediate values assumed were 1/2 and 2 for all sectors, and one
case used combined values of 1/2 for agricultural and 2 for manufac-
tured sectors, respectively (Table 7). For countries facing export
demand elasticities near 1, (Argentina and Kenya—see Table 6), export
increases from trade liberalization are nearly the same for all assumed
export supply elasticities. For countries with export demand elastic-
ities of 2 and above, export increases more than double when export
supply elasticities tend to infinity (India, Korea, Mexico, Pakistan,
Turkey, and Yugoslavia). On the other hand, export increases are
smaller for countries with export demand elasticities lower than 2
(Brazil and the Philippines). There is no significant change between
an assumed value of 2 for the export supply elasticity of all sectors
and assumed values of 1/2 and 2 for agricultural and manufactured
sectors, respectively.

Second, import demand elasticities were varied: they were
lowered by 25 percent in the first case, and raised by 25 percent
in the second. Under assumed infinite export supply, the calcula-
tions indicated a lower limit of 6.8 percent and an upper limit of
11.3 percent for increases in total exports of the sample developing
countries. Finally, the estimated rates of protection were varied
up and down by 25 percent. With export supply assumed infinite again,
lower and upper limits of 7.5 percent and 10.3 percent of increases
of total exports of the sample developing countries could be estab-
lished. 1/ Altogether, the sensitivity analyses indicated that the
increases in total exports of the sample countries would be in the
order of 5-10 percent following trade liberalization.

1/ Given the occasionally doubtful information on tariff equivalents
of NTBs in Canada, another calculation was performed assuming no change
in Canadian protection rates. The total export increases from trade
liberalization in the remaining three markets was 8.8 percent for the
sample developing countries under the assumption of infinite export
supply.

VI. Interpretation of Results

The illustrative exercise presented above is subject to several limitations. First, the exercise is based on partial analysis, and thus indicates only the static, first round effects of trade liberal- ization on developing countries. Since second round effects are not considered, it is not possible to infer where these countries would stand after all changes have worked their way through the economies of both industrial and developing countries. Moreover, the exercise does not take account of dynamic effects from trade liberalization, such as exploitation of economies of scale or intra-industry trade. These dynamic effects could help a country achieve higher export growth rates, over longer periods, than it would have achieved in the absence of trade liberalization.

Second, the exercise is based on certain simplifying assumptions. In particular, the assumption of uniform export supply elasticities in all exporting countries may overstate the sample countries' ability to meet increased export demand and hold their former market shares. Also, besides trade creation effects, there could be trade diversion against the exports from the sample developing countries, as more efficient producers undercut existing suppliers in the expanded market. Further, those developing countries which benefited from the Generalized System of Preferences or other preferential arrangements may suffer some losses after trade liberalization. At the same time, trade diversion toward exports of the sample countries may occur when nontariff trade barriers especially discriminating against these countries are removed.

Third, further research is needed to improve estimates of the parameters used in the exercise. In particular, the estimates of the tariff equivalents of trade barriers in the OECD markets for the seven sectors reflect only rough orders of magnitude, partly based on qualitative information, that can be subject to debate. In practice, NTBs take many forms and are frequently applied on a bilateral rather than a multilateral basis; thus liberalization of bilateral restrictions will have more differential effects than are considered here.

Notwithstanding these limitations, the exercise illustrates that benefits of trade liberalization on developing countries can be significant, although they would differ across countries and may be spread over a number of years. Under the illustrative exercise, a 5-10 percent real growth of exports is attributed to trade liberal- ization. In comparison, it may be noted that, in the course of the 1970s, the volume of exports from the sample countries grew on average at an annual rate of 8 percent. While the exercise is not meant to measure the impact on the balance of payments, it indicates that an improvement in market access could make a significant contribution to the export prospects and adjustment efforts of developing countries.

Table 1. Price Elasticities of Import Demand for
Seven Sectors in Four OECD Markets

	U.S.	EC 1/	Japan	Canada
Meat and meat preparations (SITC 01)	-0.53	-1.09	-1.13	-0.84
Cereals and cereal preparations (SITC 04) 2/	-0.82	-1.06	-0.56	-0.81
Sugar and sugar preparations (SITC 06) 2/	-0.82	-1.06	-0.56	-0.81
Textiles, yarn, fabrics, etc. (SITC 65)	-2.43	-2.61	-1.56	-2.09
Iron and steel (SITC 67)	-1.99	-3.25	-2.36	-2.07
Apparel and clothing (SITC 84)	-2.43	-2.61	-1.56	-2.09
Footwear (SITC 85)	-1.23	-3.17	-1.42	-2.07

Source: Cline et al., _Trade Negotiations in the Tokyo Round: A Quantitative Assessment_, Brookings, 1978.

1/ Estimates for the EC are weighted averages of individual country estimates corrected for trade diversion effects toward imports from non-EC countries following trade liberalization (see Cline, et al., op. cit., for a detailed explanation).

2/ For U.S., EC, and Japan average of estimates for BTN 02, 03, 04 (vegetable products, fats, oils; food, beverages, and tobacco).

Table 2. Tariff Equivalents of Tariffs and Nontariff Barriers
for Seven Sectors in Four OECD Markets

	United States	EC	Japan	Canada
Meat (SITC 01)	46	118	328	52
Cereals (SITC 04)	20	81	175	20
Sugar (SITC 06)	27	31	44	27
Textiles (SITC 65)	68	59	13	39
Iron and Steel (SITC 67)	35	43	8	8
Clothing (SITC 84)	79	59	18	39
Footwear (SITC 85)	9	27	16	30

Sources: See text.

Table 3. Percentage Increase of Imports in Major OECD Countries
Induced by a Complete Removal of Trade Barriers

	United States	EC	Japan	Canada	Total
Meat (SITC 01)	16.7	59.0	86.6	28.7	49.5
Cereals (SITC 04)	13.7	47.4	35.6	13.5	39.2
Sugar (SITC 06)	17.4	25.0	17.1	17.2	19.3
Textiles (SITC 65)	98.4	96.8	17.9	58.6	81.8
Iron and Steel (SITC 67)	51.6	97.7	17.5	15.3	62.4
Clothing (SITC 84)	107.2	96.8	23.8	58.6	92.6
Footwear (SITC 85)	10.1	67.4	19.6	47.8	30.4

Sources: Fund staff calculations.

Table 4. Percentage Change of Exports of Selected Sectors from
Selected Countries After a Complete Removal of Trade Barriers

	Meat SITC 01		Cereals SITC 04		Sugar SITC 06		Textiles SITC 65		Iron & Steel SITC 67		Clothing SITC 84		Footwear SITC 85		Total	
	e=0	e=inf.	e=0	e=inf.	e=0	e=inf.	e=0	e=inf.	e=0	e=inf.	e=0	e=inf.	e=0	e=inf.	e=0	e=inf.
Argentina	26.0	26.4	8.1	6.8	10.3	8.6	31.2	78.9	3.9	9.1	8.7	21.8	10.8	24.3	6.9	7.2
Brazil	22.0	22.0	13.1	10.9	9.5	8.2	19.8	49.9	12.2	29.5	19.5	49.6	10.4	21.2	2.7	4.8
India	12.3	11.7	5.6	5.9	5.6	5.9	24.9	65.3	3.4	7.6	38.0	95.7	11.6	32.4	6.1	15.1
Kenya	27.3	29.7	25.6	14.4	7.9	8.4	8.0	20.1	--	--	29.0	75.6	0.4	1.2	0.5	0.6
Korea	11.6	13.1	40.3	24.2	0.2	0.2	8.1	17.9	9.0	19.6	29.0	69.8	11.0	22.9	7.6	17.6
Mexico	70.5	77.2	9.7	7.9	22.6	21.6	22.6	55.4	15.8	31.6	43.7	106.2	10.1	17.2	1.3	2.9
Pakistan	--	--	0.5	0.5	23.7	25.0	14.5	36.3	13.7	44.4	23.4	59.2	16.3	51.8	6.5	15.9
Philippines	--	--	0.5	0.4	13.8	9.1	21.3	51.8	6.1	16.4	57.0	140.6	10.3	20.4	4.7	9.2
Turkey	4.7	5.1	1.6	1.7	7.3	7.7	24.2	63.0	19.7	61.5	20.3	52.8	2.5	7.9	4.5	11.7
Yugoslavia	17.2	16.0	2.1	2.2	0.5	0.5	6.5	16.9	8.6	24.2	24.5	63.7	3.3	9.1	2.4	5.5
Total	23.4	23.5	6.1	5.2	10.0	8.2	15.0	37.0	9.6	22.4	30.4	74.6	9.0	19.3	4.3	9.0

Source: Staff calculations.

Table 5. Percentage Change of Exports After Trade
Liberalization (e = inf.)

	Agricultural exports	Manufactured exports	Total exports
Argentina	11.8	4.4	7.2
Brazil	2.7	9.8	4.8
India	1.0	25.2	15.1
Kenya	0.8	1.1	0.6
Korea	0.5	19.6	17.6
Mexico	1.4	12.8	2.9
Pakistan	1.6	29.6	15.9
Philippines	3.9	35.6	9.2
Turkey	0.3	37.4	11.7
Yugoslavia	4.1	6.5	5.5
Total	3.7	16.3	9.0

Source: Staff calculations.

Table 6. Structure of Exports, Average Elasticity of Export Demand,
and Average Rate of Protection Against Selected Developing
Countries' Exports of Selected Sectors

	Exports of Selected Sectors in Total Exports (in percent)	Exports of Selected Sectors to Four Markets in Total Exports (in percent)	Average Elasticity of Export Demand 1/ (as implied by Table 1)	Average Rate of Protection Against Exports of Selected Sectors 1/ (as implied by Table 2) (in percent)
Argentina	49.1	15.1	-1.1	97
Brazil	18.8	9.9	-1.7	46
India	25.6	16.9	-2.4	59
Kenya	4.3	1.4	-1.2	73
Korea	44.8	27.6	-2.1	43
Mexico	4.6	3.9	-2.0	64
Pakistan	60.7	19.2	-2.3	54
Philippines	18.8	14.5	-1.8	52
Turkey	24.6	12.3	-2.6	59
Yugoslavia	21.7	7.1	-2.3	55

Source: Staff calculations.

1/ Weighted averages according to the product and geographic trade patterns.

Table 7.   Sensitivity Analysis for Variations of
the Export Supply Elasticity

(Percentage changes of total exports)

	e = 0	e = 1/2	e = 2	e = inf.
Argentina	6.9	6.9	6.9	7.2
Brazil	2.7	3.0	3.6	4.8
India	6.1	7.6	10.1	15.1
Kenya	0.5	0.5	0.5	0.6
Korea	7.6	9.3	12.1	17.6
Mexico	1.3	1.6	2.0	2.9
Pakistan	6.5	8.1	10.6	15.9
Philippines	4.7	5.4	6.6	9.2
Turkey	4.5	5.7	7.6	11.7
Yugoslavia	2.4	2.9	3.7	5.5
Total	4.3	5.1	6.4	9.0

Source: Staff calculations.

Table 1. Tariff Equivalents of Tariff and Nontariff Barriers for
Seven Sectors in Four OECD Markets as Implied by Selected Studies

(In percent)

	U.S.	EC	Japan	Canada
Meat	48[1], -16[2], -6[3]	118[1], 50[2], 104[4], 37[3]	328[1], 297[2], 219[3]	52[1]
Cereals	20[5], -55[3], 0[2]	81[8], 35[5], 73[2], 61[4], 34[3]	175[2], 70[5], 139[3]	
Sugar	27[6], 18[3]	31[4], 46[2], 33[3]	44[2], 53[3]	
Textiles	59[5], 37[7]	50[5]	18[5]	39[10]
Iron and steel	14[7], 5[9]	6[9]	3[9]	
Clothing	70[5], 9[7]	50[5]	23[5]	39[10]
Footwear	11[7], 9[9]	12[9]	16[9]	...
All sectors	33[5]	38[5]	62[5]	...

[1] FAO, "Protectionism in the Livestock Sector," Rome, 1980. Estimates refer to beef for 1977-79.

[2] S.J. Anjaria, et. al., "Developments in International Trade Policy," IMF Occasional Paper No. 16, Washington, D.C., 1982. Meat estimates refer to beef for 1977-79. Cereal estimates refer to a simple average for rice, maize, and wheat for the United States; maize and wheat for the EC; and rice, wheat, barley, and soybeans for Japan in 1979-80.

[3] Japan Economic Institute, "Agricultural Protectionism," Tokyo, 1983. Estimates for meat refer to beef; for cereals, to grains for the United States and the EC, and to a simple average for rice, wheat, and barley for Japan in 1978-80. Estimates for sugar also refer to 1978-80.

[4] Commonwealth Secretariat, Protectionism: Threat to International Order, London, 1982. Estimates for meat refer to beef; and for cereals to a simple average for rice, maize, and wheat in 1979-80. Estimates for sugar refer to the same time period.

[5] A.J. Yeats, Trade Barriers Facing Developing Countries, New York, 1979. All estimates are for 1973. For cereals, estimates refer to grains and grain products; for textiles, clothing, and manufactures, estimates are the sum of post-Kennedy Round tariffs and tariff equivalents for nontariff barriers. Tariff equivalents for nontariff barriers refer to apparel for both textiles and clothing.

[6] Derived from U.S. Department of Agriculture, "Sugar and Sweetener: Outlook and Situation," Washington, D.C., 1981. Estimates refer to 1979-80. Transport costs were assumed at 6 percent of the c.i.f. price.

[7] P. Morici and L.L. Megna, U.S. Economic Policies Affecting Industrial Trade, Washington, D.C., 1983. The tariff equivalent for textiles includes the impact of the Multifiber Arrangement; for iron and steel, it includes the effects of several Orderly Market Agreements with Japan and quotas against other producers; for footwear, it includes Orderly Market Agreements with Taiwan and Korea between 1977-79.

[8] U. Koester, "Policy Options for the Grain Economy of the European Community: Implications for Developing Countries," IFPRI Research Report No. 35, Washington, D.C., 1982. Estimates refer to a simple average for wheat, barley, and maize for 1979-80.

[9] Pre-Tokyo Round tariffs calculated in A.V. Deardorff and R.M. Stern, "The Effects of the Tokyo Round on the Structure of Protection." Paper presented at the Conference on the Structure and Evolution of Recent U.S. Trade Policy, National Bureau of Economic Research, Cambridge, Mass., December 1982.

[10] M. Wolf, "Managed Trade in Practice: Implications of the Textile Arrangements in:" W.R. Cline (ed.), Trade Policies in the 1980s, Washington, D.C., 1983. The simple average of total protective rates for 16 products in 1979 was employed.

Table 2. Import Penetration Ratios Before and After
Complete Removal of Trade Barriers in Major OECD Countries 1/

(In percent)

	U.S.		EC 2/		Japan		Canada	
	IP_o	IP_x	IP_o	IP_x	IP_o	IP_x	IP_o	IP_x
Food (ISIC 31)	5.4	5.7	20.1	21.4	5.9	8.6	10.9	11.7
Textiles and clothing (ISIC 32)	11.4	20.9	42.4	56.0	9.7	11.3	23.5	35.0
Base metals (ISIC 37)	11.1	14.5	35.9	40.9	8.3	8.5	36.4	40.2
Manufacturing (ISIC 3)	8.7	9.7	32.0	33.8	6.0	6.6	33.1	34.3

Sources: World Bank, Market Penetration System Data Base; and Fund
staff calculations.

1/ The computations are based on the assumption that total consumption
would not change after trade liberalization, and increased imports would
replace domestic production. Thus, the figures represent indicative upper
limits to the immediate effects of the removal of trade barriers on import
penetration. Because the aggregation level is not the same, there is no
exact correspondence between the changes in imports presented in Table 3
and the changes in import penetration ratios presented above.
   2/ Includes intra-EC trade.

Note: IP$_o$ refers to 1979-80;
         IP_x is the post-liberalization import penetration ratio.

CHART 1
EXPORTERS' REVENUES UNDER DIFFERENT EXPORT SUPPLY ELASTICITY ASSUMPTION
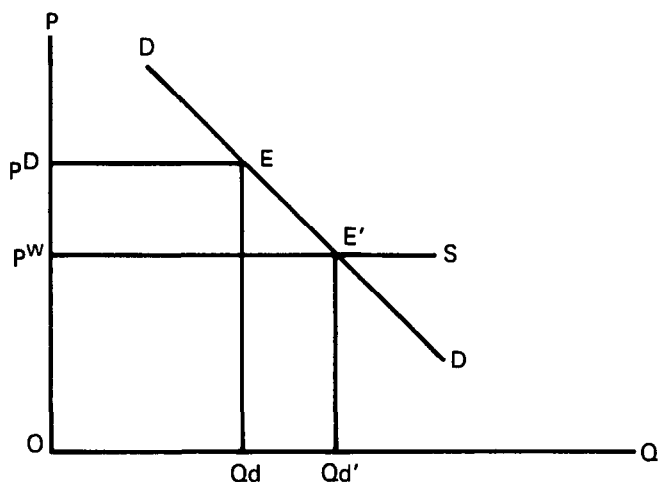
FIGURE A
$(e = \infty)$

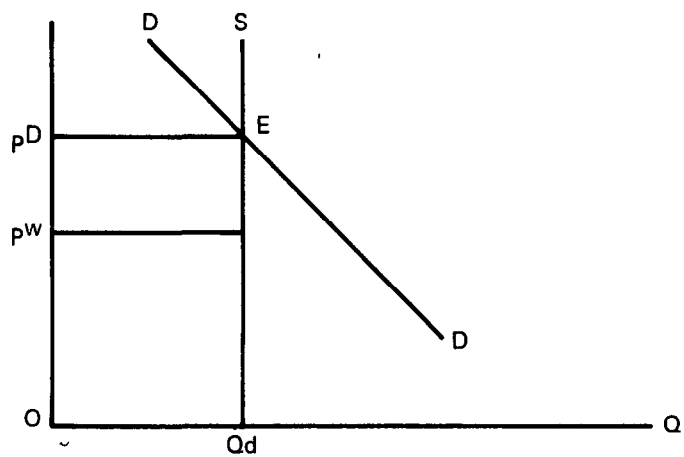### FIGURE B
$(e = 0)$

FIGURE C
$(0 < e < \infty)$